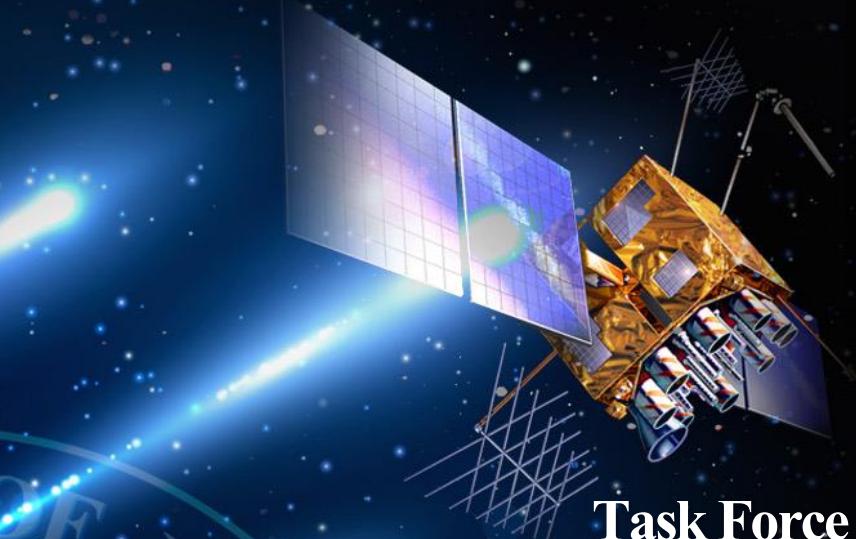




DEPARTMENT OF DEFENSE DEFENSE SCIENCE BOARD



Task Force on **Defense Strategies for Ensuring the Resilience of National Space Capabilities**

Executive Summary

March 2017

This Executive Summary is a product of the Defense Science Board (DSB). The DSB is a Federal Advisory Committee established to provide independent advice to the Secretary of Defense. Statements, opinions, conclusions, and recommendations in this report do not necessarily represent the official position of the Department of Defense.

The DSB Task Force on Defense Strategies for Ensuring the Resilience of National Space Capabilities completed its formal information gathering in February 2016, but continued to update factual input through final report review.

This Executive Summary is cleared for public release.

DSB Task Force on Defense Strategies for Ensuring the Resilience of National Space Capabilities

Executive Summary

Table of Contents

Executive Summary	1
Appendix A: Task Force Terms of Reference (TOR).....	2
Appendix B: Task Force Membership	3
Appendix C: Briefings Received.....	4

DSB Task Force on Defense Strategies for Ensuring the Resilience of National Space Capabilities

Executive Summary

Since 2000, when the Defense Science Board concluded space superiority was absolutely essential in achieving global awareness, information dominance on the battlefield, deterrence of potential conflict and superiority combat effectiveness of our forces, and threats to space superiority have grown significantly. The DSB Task Force on Defense Strategies for Ensuring the Resilience of National Space Capabilities, requested on December 1, 2014, by the Office of the Secretary of Defense for Acquisition, Technology and Logistics (OSD(AT&L)) and led by co-chairs Dr. Wanda M. Austin and Vice Admiral David E. Frost, U.S. Navy (Retired), examined:

- current and projected threats
- strategies to enhance net resilience of the U.S. national security space enterprise (inclusive of those provided by international partners and the commercial sector); and,
- all facets of space control, critical enabling doctrine, and policy concepts.

From April 2015 through September 2016, the Task Force received more than 40 briefings from practitioners and senior officials throughout DoD, the intelligence community (IC), the commercial sector, academia, the national laboratories, and the policy community. As a result of the deliberations, the Task Force concludes:

- Space capabilities are essential to U.S. national security and can be made more resilient through all phases of conflict with investment and commitment.
- A specific strategy and implementation plan is recommended in a classified report.

Appendix A: Task Force Terms of Reference (TOR)



ACQUISITION,
TECHNOLOGY
AND LOGISTICS

THE UNDER SECRETARY OF DEFENSE

3010 DEFENSE PENTAGON
WASHINGTON, DC 20301-3010

DEC 01 2014

MEMORANDUM FOR CHAIRMAN, DEFENSE SCIENCE BOARD

SUBJECT: Terms of Reference –Task Force on Defense Strategies for Ensuring the Resilience of National Space Capabilities

In 2000, the Defense Science Board concluded that space superiority is absolutely essential in achieving global awareness, information dominance on the battlefield, deterrence of potential conflict and superior combat effectiveness of our forces. Since then we have made efforts to assess and enhance our space situational awareness, space protection, and space defense. At the same time, our potential adversaries have significantly advanced their awareness of our dependence on space for critical defense functions such as ISR sensing, communication, PNT and strategic indications and warning, and have developed and fielded capabilities to challenge these high-value operational enablers.

This study will identify and recommend, in the context of current and projected threats, strategies to enhance the net resilience of our national security space enterprise including those critical elements provided by our international partners and the commercial sector. The study should consider all facets of space control including the balanced roles of deterrence measures, the requirements of space situational awareness, protection measures and active defense concepts. Identification of critical enabling doctrine and policy concepts must also be considered. Questions the study may address include what are the demonstrated, evolving and projected future technical threats to our space security; what are the projected future motivations and intentions of both state and non-state actors to threaten the space enterprise; how can we achieve the necessary degree of space domain awareness sufficient to enable critical resilience strategies; what does science, technology and operational art contribute to deterrence and active defense concepts; and what are the vulnerabilities of and strategies for off-setting the space system architectures of potential adversaries.

I will sponsor the study. Dr. Wanda Austin, Ph.D., and VADM David E. Frost, USN Ret., will serve as Co-chairmen of the study. Colonel Russell F. Teehan, USAF, will serve as Executive Secretary. Captain James CoBell, USN will serve as the Defense Science Board Secretariat Representative.

The study will operate in accordance with the provisions of P.L. 92-463, the “Federal Advisory Committee Act” and DoD Directive 5105.04, the DoD Federal Advisory Committee Management Program.” It is not anticipated that this study will need to go into any “particular matters” within the meaning of title 18, United States Code, section 208, nor will it cause any member to be placed in the position of action as a procurement official.

Frank Kendall

Appendix B: Task Force Membership

Co-Chairs

Dr. Wanda M. Austin
VADM David E. Frost, USN (Ret.)

Members

Dr. Amy Alving
Mr. Rhett Breeden
Mr. Keith Hall
Lt Gen Susan Helms, USAF (Ret.)
Hon. Paul Kaminiski
Dr. Ronald Kerber
Gen Lester Lyles, USAF (Ret.)
Mr. Alden Munson, Jr.
Maj Gen Jay Santee, USAF (Ret.)
Mr. Darryl Sargent
Dr. Grant Stokes
Mr. David Van Buren
Dr. David Whelan

Government Advisors

Dr. Larry Gershwin – ODNI/NIM Science and Technology

Executive Secretary

Col Russell Teehan, USAF – AT&L/Space, Strategic and Intel Systems

DSB Secretariat

Col Mike Harvey, USAF – Defense Science Board
Lt Col Victor Osweiler, USAF – Defense Science Board

Support

Hannah Johnson – SAIC
Brenda Poole – SAIC

Appendix C: Briefings Received

1-2 April 2015

- National Security Council (NSC) Perspectives, Mr. Chirag Parikh, Space Policy Director, NSC
- 2014 DOD Space-Strategic Portfolio Review, Mr. Doug Loverro, DASD Space Policy, and Dr. Karen St. Germain, AT&L
- Threats to Space Systems, Dr. Lawrence Gershwin, ODNI/NIM S&T
- Space Protection Overview, Mr. Andrew Cox, Director SSDP
- National Reconnaissance Office –Current/Future Resilience Challenges, Ms. Betty Sapp, DNRO
- NRO Survivability Assurance Office Overview, Dr. Stewart Cameron, Director SAO

5-6 May 2015

- Joint Space Operations, MG DT Thompson, USSTRATCOM/JS
- Space Control Acquisition Programs, Col Erik Bowman, Deputy Director SMC/SY
- Long Range R&D Planning Program (LRRDPP), Dr. Greg Spaniers, Chief Scientist AFRL/RV
- Space Acquisition/Governance (EA4S), LtGen Ellen Pawlikowski, Office of the Assistant Secretary of the Air Force for Acquisition
- Summer Study Review, Dr. Dave Whelan
- Space Resilience Challenges, DNI Perspective, Dr. Troy Meink, Assistant DNI for Systems and Resource Analysis (ADNI/SRA)
- Joint Space Operations Center, LtGen John Raymond, Commander 14th AF, JFCC (Space)
- DARPA Space Portfolio, Dr. Brad Tousley, DARPA TTO Director

18-19 June 2015

- Commercial SATCOM – Gov't/Commercial Opportunities and Challenges, Mr. Chuck Cynamon, MDA Information Systems
- Commercial Space – Affordable Resilient Wideband Communication Options, Mr. Christopher Johnson and Mr. Dan Hart, the Boeing Company

- Space Resilience – HQ AFSPC Perspective, Gen John Hyten, Commander AFSPC
- Wideband SATCOM – Gov't Innovation (Protected Tactical Waveform and COMSATCOM Pathfinders), Mr. Joe Vanderpoorten and Mr. Ric Agardy, SMC MILSATCOM SPO, SMC/MCX)
- Space Situational Awareness, Mr. Jay Donnelly and Mr. Marshall Brenizer, MIT Lincoln Laboratory
- Innovation in Space Situational Awareness, Mr. Paul Graziani, AGI, and Ms. Kay Sears, IntelSat

8-9 July 2015

- 2015 Space SPR Overview, Mr. John Orem, OSD Cape
- Space 1TX (2014 SPR and 2015 Olympus Star), Dr. Karen St. Germain and Col Ed Hospodar, AT&USSI, Col Jeff Hokett, STRATCOM/JS, and Dr. Margaret McCown, JS/J8
- Space Support to Naval Operation/PACFLEET, Mr. William Flynn, Deputy Chief for Naval Operations N2/N6, Senior Advisor for Space
- Space Support to PACOM (VTC), HQ USPACOM
- Resilient Space Architectures, Mr. Jeff Grant and Mr. Doug Young, Northrop Grumman Commercial Space Opportunities, Mr. John Fenwick, Skybox

4-5 August 2015

- Space Resilience: Mr. Marc Berkowitz, Mr. Justin Keller, Lockheed Martin SATCOM Resilience: Dr. Michele Schuman, MIT/LL
- GPS Resilience: Mr. Mike Sanjourne, Ms. Rita Lollok, Space & Missile Systems Center, SMC/GPU
- SBIRS Follow On AoA Discussion: Dr. Thomas Walker, HQ AFSPC/A8, Captain Kassandra Miller, HQ AFSPC/ASF, Dr. Karen St. Germain, OSD/AT&L
- Architecture – Level Resistance: Mr. Roy Evans, MITRE
- Protected SATCOM AoA and Technical Trades: Mr. Ric Agardy, Aerospace Space & Missile Systems Center, SMC/MCX
- Joint Space Operations: ADM Cecil Haney, Commander USSTRATCOM

24-25 September 2015

- Resilience through International/Commercial Partnerships: Mr. Doug Loverro, DASD Space Policy
- Intel Support to Space Ops: Dr. Sean Kirkpatrick, DIA
- Space Resilience (VTC): Dr. Stewart Cameron, Director SAO
- Space Support to PACOM Operations: Admiral Harry Harris, Commander, US Pacific Command
- DNI Perspective on Space Resilience: Ms. Stephanie O'Sullivan, PDDNI
- AFRL Space Technology Development: Ms. Monica Montoya, AFRL/RV, Mr. Dan Staggenborg, AFRL/RYS
- Space Resilience Follow-Up: Dr. Stewart Cameron, Director SAO

8-9 October 2015

- Project Sextant – Alternative PNT: Dr. Randy Villahermosa, Aerospace
- PTW Assessment: Dr. Samuel Curry, Dr. Robert Frueholz, Aerospace
- White House / OMB Perspective: Mr. Matt O'Kane, Office of Management and Budget

2-3 November 2015

- Space: Senior Leadership Perspective: Admiral James "Sandy" Winnefeld, (USN, Ret.)